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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,712	01/08/2002	Robert G. Tryon III	10652-005-999	6460

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EXAMINER	
BARAN, MARY C	

ART UNIT	PAPER NUMBER
2857	

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/043,712	TRYON ET AL.	
	Examiner	Art Unit	
	Mary Kate B Baran	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-76* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *68-76* is/are allowed.

6)☒ Claim(s) *1-4,6-17,25,26,28-37,44-46,48,49,51-53,55-59,66 and 67* is/are rejected.

7)☒ Claim(s) *5,18-24,27,38-43,47,50,54 and 60-65* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 27 September 2004 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 6-8, 12-14, 17, 25, 26, 28-34, 44, 48, 49, 51, 55, 56, 66 and 67 are rejected under 35 U.S.C. 102(e) as being anticipated by Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist).

Referring to claims 1, 25 and 48, Quist teaches a computer implemented method, apparatus, and a computer program product for use in conjunction with a computer system for monitoring a system (see Quist, column 20 lines 27-29 and lines

33-36), comprising: sensors for acquiring sensed data indicative of a current physical state of a particular system (see Quist, column 3 lines 27-33); one or more data processing systems (see Quist, Figure 1) including a first computer comprising: a processor (see Quist, column 5 lines 19-22); a memory containing: instructions for receiving data including said acquired data (see Quist, column 4 lines 12-21); instructions for determining a current operation status of said particular system using a physics based probabilistic model to determine the current operation status based on a probable response of the particular system to one or more external parameters at a current time, and further using said acquired data (see Quist, column 3 lines 49-56); and instructions for communicating said current operation status (see Quist, column 3 lines 57-61); and a communication device for communicating said current operation status (see Quist, column 3 lines 57-61).

Referring to claim 2, Quist teaches that said measuring further comprises receiving system information from said system (see Quist, column 4 lines 17-21).

Referring to claim 3, Quist teaches that said creating further comprises calculating a prediction of a failure of a component of said system (see Quist, column 5 lines 7-10 and column 8 lines 32-36).

Referring to claim 4, Quist teaches that said creating further comprises calculating a prediction of a failure of multiple systems based on said prediction (see Quist, column 6 lines 7-20).

Referring to claim 6, Quist teaches comparing said prediction to criteria (see Quist, column 6 lines 7-16).

Referring to claim 7, Quist teaches that at least one of said calculating and communicating steps occurs at a location remote from the system (see Quist, column 3 lines 49-61 and Figure 1).

Referring to claims 8, Quist teaches that said probabilistic model comprises multiple pre-selected physics based probabilistic models, wherein at least one of the multiple pre-selected physics based probabilistic models is selected to calculate the prediction based on the one or more pre-determined failure modes of the system (see Quist, column 5 lines 36-45).

Referring to claim 12, Quist teaches sending at least some of said received data to a remote location and wherein said calculating said prediction occurs at said remote location (see Quist, column 5 lines 36-45).

Referring to claim 13, Quist teaches receiving said prediction from said remote location (see Quist column 5 lines 46-50).

Referring to claim 14, Quist teaches developing said physics based probabilistic model prior to said calculating said prediction (see Quist, column 3 lines 49-56).

Referring to claim 17, Quist teaches that said developing further comprises setting criteria for communicating said prediction (see Quist column 3 lines 49-65).

Referring to claim 26, Quist teaches that said instructions for determining the current operation status further comprise instructions for determining a probable response of at least one component of said system to the one or more external parameters at the current time (see Quist, column 5 line 67 – column 6 line 6).

Referring to claims 28 and 66, Quist teaches that the one or more data processing systems further comprise instructions for determining a future operation status of said particular system using the physics based probabilistic model (see Quist, column 5 lines 36-45).

Referring to claim 29, Quist teaches a second computer program product comprising a second computer readable storage medium and a second computer program mechanism embedded therein (Quist et al., Figure 1) containing: instructions

for receiving said current operation status (Quist et al., column 5 lines 23-28); and instructions for communicating said current operation status (Quist et al., column 5 lines 46-50).

Referring to claim 30, Quist teaches that said communication device further comprises a warning signal (see Quist, column 5 lines 10-15).

Referring to claim 31, Quist teaches that said apparatus further comprising a sending device for sending said data to a location remote from the system (see Quist, column 3 line 66 – column 4 line 11).

Referring to claim 32, Quist teaches that said first computer is located remote from the system (see Quist, column 4 lines 12-21).

Referring to claim 33, Quist teaches instructions for comparing current operation status to criteria (see Quist, column 6 lines 7-16).

Referring to claim 34, Quist teaches that said physics based probabilistic model comprises multiple models (see Quist, column 5 lines 36-45).

Referring to claim 44, Quist teaches that said instructions for creating further comprise instructions for creating a prediction of a failure of multiple systems based on said prediction (see Quist, column 6 lines 7-20).

Referring to claim 49, Quist teaches that the instructions for determining the failure probability of the system further comprise instructions for determining a probable response of at least one component of said system to the at least one force (see Quist, column 3 lines 49-56).

Referring to claim 51, Quist teaches that said instructions for determining a failure probability further comprise instructions for determining a failure probability of multiple systems based on said sensed data indicative of the current physical state (see Quist, column 6 lines 7-20).

Referring to claim 55, Quist teaches instructions for comparing said failure probability to criteria (see Quist, column 6 lines 7-16).

Referring to claim 56, Quist teaches that said probabilistic model comprises multiple physics based probabilistic models (see Quist, column 5 lines 36-45).

Referring to claim 67, Quist teaches a second computer program product comprising a second computer readable storage medium and a second computer

program mechanism embedded therein (Quist et al., Figure 1) containing: instructions for receiving said failure probability (Quist et al., column 5 lines 23-28); and instructions for communicating said failure probability (Quist et al., column 5 lines 46-50).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 9, 15, 35, 45, 52, 54 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quist et al. (U.S. Patent No. 6,199,018) in view of Gollomp (U.S. Patent No. 4,766,595).

Referring to claims 9, 35 and 57, Quist teaches all the features of the claimed invention except for ranking variables in said physics based probabilistic model according to said variable's contribution to said prediction, current operating status and failure probability.

Gollomp teaches ranking variables in said probabilistic model according to said variable's contribution to said prediction, current operating status, and failure probability (see Gollomp, column 5 lines 3-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Quist to include the teachings of Gollomp because

ranking the variables would have allowed the skilled artisan to determine which failures are more important (see Gollomp, column 3 lines 61-64).

Referring to claim 15, Quist teaches all the features of the claimed invention except for identifying at least one failure mechanism of a component of said system from said component's characteristics selected from the group consisting of: material properties, environmental conditions, design characteristics, component loading, and component usage; identifying significant random variables of said at least one failure mechanism; identifying statistical parameters of said significant random variables; and formulating a strategy for physics based probabilistic analysis based on said identifying steps.

Gollomp teaches identifying at least one failure mechanism of a component of said system from said component's characteristics selected from the group consisting of: material properties (see Gollomp, column 3 lines 28-34), environmental conditions (see Gollomp, column 3 lines 28-34), design characteristics (see Gollomp, column 3 lines 6-9), component loading (see Gollomp, column 3 lines 28-34), and component usage (see Gollomp, column 3 lines 28-34); identifying significant random variables of said at least one failure mechanism (see Gollomp, column 3 lines 61-66); identifying statistical parameters of said significant random variables (see Gollomp, column 3 line 66 – column 4 line 1); and formulating a strategy for physics based probabilistic analysis based on said identifying steps (see Gollomp, column 4 lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Quist to include the teachings of Gollomp because identifying the component failure and performing probabilistic analysis would have allowed the skilled artisan to determine performance degradation (see Gollomp, column 4 lines 1-4).

Referring to claims 45 and 52, Quist teaches all the features of the claimed invention except that said probabilistic model comprising at least one failure mechanism of a component of said system.

Gollomp teaches that said probabilistic model comprising at least one failure mechanism of a component of said system (see Gollomp, column 5 lines 3-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Quist to include the teachings of Gollomp because having a model with a system component failure would have allowed the skilled artisan to generate an improved behavior model (see Gollomp, column 62-67).

4. Claims 10, 36, 46, 53 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist) in view of Eastman et al. (U.S. Patent No. 6,226,597) (hereinafter Eastman).

Referring to claims 10, 36 and 58, Quist teaches all the features of the claimed invention except for predicting failure in a material's microstructure.

Eastman teaches predicting failure in a material's microstructure (see Eastman, column 5 lines 57-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Quist to include the teachings of Eastman because monitoring a failure in the microstructure allows the skilled artisan to determine an acceptable failure rate so that the system can maintain or increase its level of reliability (see Eastman, column 2 lines 44-50).

Referring to claims 46 and 53, Quist teaches all the features of the claimed invention except that said at least one failure mechanism relates to a material microstructure.

Eastman teaches that said at least one failure mechanism relates to a material microstructure (see Eastman, column 5 lines 61-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Quist to include the teachings of Eastman because monitoring a failure in the microstructure allows the skilled artisan to determine an acceptable failure rate so that the system can maintain or increase its level of reliability (see Eastman, column 2 lines 44-50).

5. Claims 11, 37 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist) in view of Bajpai et al. (U.S. Patent No. 4,985,857) (hereinafter Bajpai).

Referring to claims 11, 37 and 59, Quist teaches all the features of the claimed invention except that said data comprises referred data, and inferred data and wherein said method further comprises relating said referred data to a first set of variables, relating said sensed data to a second set of variables, and inferring a third set of variables from said sensed data.

Bajpai teaches that said data comprises referred data (see Bajpai, column 1 lines 62-65), and inferred data (see Bajpai, column 2 lines 18-21) and wherein said method further comprises relating said referred data to a first set of variables, relating said sensed data to a second set of variables, and inferring a third set of variables from said sensed data (see Bajpai, column 1 lines 59-61).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Quist to include the teachings of Bajpai because multiple sets of data would have allowed the skilled artisan to diagnose multiple problems on a given machine (see Bajpai, column 2 lines 50-59).

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist) in view of Gollomp (U.S. Patent No. 4,766,595) and further in view of Bajpai et al. (U.S. Patent No. 4,985,857) (hereinafter Bajpai).

Referring to claim 16, Quist and Gollomp teach all the features of the claimed invention except that said data comprises referred data, sensed data, and inferred data and wherein said developing step further comprises determining which of said

significant random variables are related to said referred data, which of said significant random variables are related to said sensed data, and which of said significant random variables are inferred from said sensed data.

Bajpai teaches that said data comprises referred data (see Bajpai, column 1 lines 62-65), and inferred data (see Bajpai, column 2 lines 18-21) and wherein said developing step further comprises determining which of said significant random variables are related to said referred data (see Bajpai, column 1 line 62 – column 2 line 5), which of said significant random variables are related to said sensed data (see Bajpai, column 2 lines 6-17), and which of said significant random variables are inferred from said sensed data (see Bajpai, column 2 lines 18-40).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Quist to include the teachings of Bajpai because multiple sets of data would have allowed the skilled artisan to diagnose multiple problems on a given machine (see Bajpai, column 2 lines 50-59).

Allowable Subject Matter

7. Claims 5, 18-23, 24, 27, 38-43, 47, 50, 54 and 60-65 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 68-76 are allowed.

9. The following is a statement of reasons for the indication of allowable subject matter: claims are allowable over the prior art of record because a method for predicting failure in a system, wherein during system operation, ascertaining a probability of failure for each of a plurality of pre-determined failure mechanisms using a physics based first probabilistic failure model, wherein said probability of failure for each of said failure mechanisms is based at least partially on said received data and said pre-determined failure mechanisms is not found, taught or suggested in the prior art of record.

Response to Arguments

10. Applicant's arguments filed 27 September 2004 have been fully considered but they are not persuasive.

Applicant argues that Quist does not teach that the data is "indicative of a system response to a specific load on the system while the system is in operation other than undergoing a system test"; however, Applicant's arguments are not well taken. Quist does teach a system for diagnostic testing, however, it is also specified that this system may be used during operation and not specifically for testing alone (see Quist, column 20 lines 27-29 and lines 33-36).

Applicant further argues that Quist does not teach that the pre-selected physics based probabilistic model is "selected to calculate said prediction based on at least the specified load"; however, Applicant's arguments are not well taken. Quist teaches a

model (see Quist, column 13 line 33, Equation 1) which is used for prediction (see Quist, column 13 lines 5-24) and is based on the load (see Quist, column 13 lines 34-38).

Applicant further argues that Quist does not teach "at least one of the multiple pre-selected physics based probabilistic models is selected to calculate the prediction based on the one or more pre-determined failure modes of the system"; however, Applicant's arguments are not well taken. Quist teaches that at least one of the multiple pre-selected physics based probabilistic models, for example the temperature/load model (see Quist, column 13 line 33, Equation 1) is used to calculate the prediction (see Quist, column 13 lines 5-24) based on one or more pre-determined failure modes of the system, such as a jump in temperature (see Quist, column 8 lines 20-36).

Applicant further argues that Quist does not teach "instructions for determining a current operation status of said particular system using a physics based probabilistic model to determine the current operation status based on a probable response of the particular system to one or more external parameters at a current time, and further using said acquired data"; however, Applicant's arguments are not well taken. Quist does teach determining a current operation status (see Quist, column 3 lines 27-33) of an external local machine (see Quist, column 3 lines 27-33), and using a physics based probabilistic model (see Quist, column 13 line 33, Equation 1) and raw temperature data (see Quist, column 13 lines 25-31) the prediction program provides a recommendation concerning the operation of the machine (see Quist, column 13 lines 5-9).

Applicant further argues that Quist does not teach "the physics based probabilistic model to determine the failure probability based on modeling a response of the system to at least one force"; however, Applicant's arguments are not well taken. Quist teaches a physical based probabilistic model (see Quist, column 13 line 33, Equation 1) to determine the failure probability (see Quist, column 13 lines 5-9) based on modeling a response of the system to at least one force, for example the load (see Quist, column 13 lines 25-31).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Kate B Baran whose telephone number is (571) 272-2211. The examiner can normally be reached on Monday - Friday from 9:00 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S Hoff can be reached on (571) 272-2216. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

22 November 2004

MARC S. HOFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800